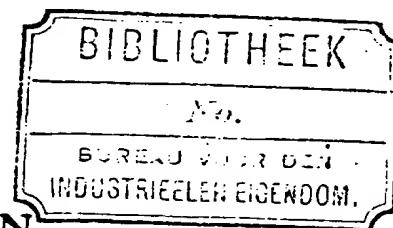


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PATENT SPECIFICATION



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133,047

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COMPLETE SPECIFICATION.

Improved Mariners' Liquid Compass.

I, GIOVANNI BOCCARDO, of No. 33, Vico Barnabiti, Genova, Italy, Chief Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to liquid mariners' compasses in which the expansion of the liquid is provided for.

This invention also relates to compasses in which means are provided for obtaining a combined reflection of the compass card degrees and a fixed scale relative to the longitudinal axis of the vessel.

It has been proposed to make liquid compasses with an annular chamber for the expansion of the liquid and with a central receptacle for allowing bubbles to escape, said receptacle being adapted to be closed by a valve.

It has also been proposed in connection with other forms of compasses to arrange a scale, graduated in degrees, above the compass card.

It is also known to illuminate a compass card from beneath in which the rays of light are reflected by a conical surface but in such case the viewing system is designed to enable only a portion of the compass card to be seen.

The present invention consists in mounting in the centre of the top glass enclosing the fluid chamber, a receptacle communicating with the interior of the fluid chamber and with the atmosphere by one or more openings so that the alteration of the level of the liquid due to the increase and decrease in volume takes place only within the said receptacle.

The present invention also consists in mounting a fixed circular scale, graduated in degrees relative to the longitudinal axis of the vessel, in a vertical position on the

interior of the upper wall of the compass body, said scale having its lower edge above the level of the compass card, and in making the lower wall of the compass body in the form of a cone so that rays coming from a source of light arranged in the lower part of the compass which would not otherwise reach the vertical scale and the scale on the compass card, are reflected by the said conical surface on to both scales so that a combined illuminated reflection of them is obtained by suitable means arranged on the bezel of the compass.

The invention is illustrated according to one example in the accompanying drawings in which:—

Fig. 1 is a central vertical section and

Fig. 2 is a plan view of the improved compass.

As shown 1 is the body of the compass enclosing the liquid provided at its upper part with an annular piece 2 fastened to the body which by pressing on the rubber packing 3 secures a tight joint between the glass plate 4 and the body 1 of the compass. In the same manner an annular piece 5 also fixed to the body 1 of the compass and pressing on the packing 6, secures a tight joint between the glass plate 7 and the body of the compass 1. The glass plate 4 is supplied at its centre with a brass hub 8 on which is threaded the receptacle 9 communicating with the interior of the liquid chamber. This receptacle is filled up with liquid for about half of its volume, so that the oscillation of the level caused by the increase or decrease in volume will exclusively take place within the receptacle and eliminate in the interior of the compass, the appearance of air-bubbles which interferes with the reading of the scale as frequently happens in diaphragm compasses. The

[Price 1/-]

capacity of this receptacle is conveniently selected to be three times the difference of volume which the liquid in the compass may assume between a temperature changing from 0 to 60 degrees Celsius. The receptacle is supplied with two small threaded pins 10 each having a capillary hole in its axis for the passage of air. These pins can be removed for adding liquid. In the upper part of the compass on the inner wall of the body of the compass there is applied a scale 11 constituted by a band fastened on the body of the compass. This band has its ground colour in black with white indications and numbers painted on it so that they stand up slightly above the background to distinguish them from the incised indications on the compass card. In the interior of the compass submersed in the fluid there is arranged a frame 12 having three arms, which form one cast piece with the conical shaped wall of the body of the compass. This frame has in its centre a support 13 supplied with a detachable point of very hard metal 13'. On this point is supported in known manner by the intermission of a sapphire the usual compass card constituted of small magnets 15 connected together by the frames 14 and 16 and with the compass card 17. The scale on the compass card is preferably made by incised lines differently coloured to scale 11 in such a manner as to clearly differentiate from the scale on the inner wall of the body of the compass in order to easily distinguish the two scales from one another. The lower part of the body of the compass is so formed as to present a conical shape with such an angle so as to cause the rays coming from the electric lamp 19, which would not otherwise reach the scales to be reflected from the said inner wall of the compass and to be directed upwardly upon the scales. The dotted lines 31 shows a ray of light impinging upon the conical surface and the dotted line 32 the direction in which this ray is reflected upwards between the scales; a , a being the angles of incidence and reflection. An annular piece 18 rotatably arranged on the upper face of the body of the compass carries on diametrically opposed points, two posts with sighting members 19 and 20 supplied with slides 21 and 22 respectively. The slide 21 supports a small frame 21' hinged with the slide and having on its two faces, mirrors, one for the employment in day light, the other for observations during the night and both serving to bring the image of an object or star when too high, within the range of vision of the observer.

The slide 22 has an eye piece 23 for the observer, and two coloured glasses 24 to dull or lessen the light coming from the star if too bright. The post 19 is supplied from the top to the bottom with a thread 25 serving as a sighting line and at the bottom carries a lenticular prism 26 that can be rotated around a horizontal axis. To mark the mid vertical plane of this prism a vertical black line is engraved and arranged in connection with the thread 25 in such a manner that, to the eye of the observer this line appears as a prolongation of the thread imposed on the reflection of the scales. The 0° line of the scale 11 fixed on the inner wall of the body of the compass 0 corresponds with the longitudinal axis of the vessel. By means of the prism 26 an enlarged reflection of the scale of the compass card and of the scale on the inner wall of the body of the compass are seen simultaneously and read by the observer who in having his eye at the opening 23 of the slide 22 and bringing the object to be sighted in line with the thread 25 of the post 19, will, with a slight downward movement of the pupil of the eye, read the magnetic bearing on the compass card of the object sighted with the North Pole and the measurement of the angle included between the longitudinal axis of the vessel and the object sighted, on the scale 11. The compass card scale 17 shines upwards along the dotted line 34 and is reflected by the prism 26 along the dotted line 33 in the direction of the observer's eye.

The receptacle 9 can be unscrewed and removed from the hub 8 so that specially adapted tools may be introduced into the interior to hold the card and to unscrew the bearing in order to extract the head fitted with the sapphire bearing as well as the point 13' supporting the compass card so that it is possible to verify these parts as to their being in good condition or otherwise.

The body of the compass is suspended by the diametrically arranged knife edges 27 on the ring 28 in its turn supported by the diametrically arranged pins 29 within supports fastened on the column on which the body of the compass is mounted constituting a gimbal suspension as usual in all mariners' compasses.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. An improved mariner's liquid com-

- pass in which there is mounted in the centre of the top glass enclosing the fluid chamber, a receptacle communicating with the interior of the fluid chamber and with the atmosphere by one or more openings so that the alteration of the level of the liquid due to the increase and decrease in volume takes place only within the said receptacle.
- 5 2. An improved mariner's liquid compass as claimed in Claim 1 in which a fixed circular scale, graduated in degrees relative to the longitudinal axis of the vessel, is mounted in a vertical position
- 10 on the interior of the upper wall of the compass body, said scale having its lower edge above the level of the compass card, and the lower wall of the compass body
- is made in the form of a cone so that rays coming from a source of light arranged 20 in the lower part of the compass which would not otherwise reach the vertical scale and the scale on the compass card, are reflected by the said conical surface on to both scales so that a combined 25 illuminated reflection of them is obtained by suitable means arranged on the bezel of the compass.
3. The improved mariner's liquid compass substantially as hereinbefore 30 described and as illustrated in the accompanying drawings.

Dated this 3rd day of September, 1919.

MARKS & CLERK.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

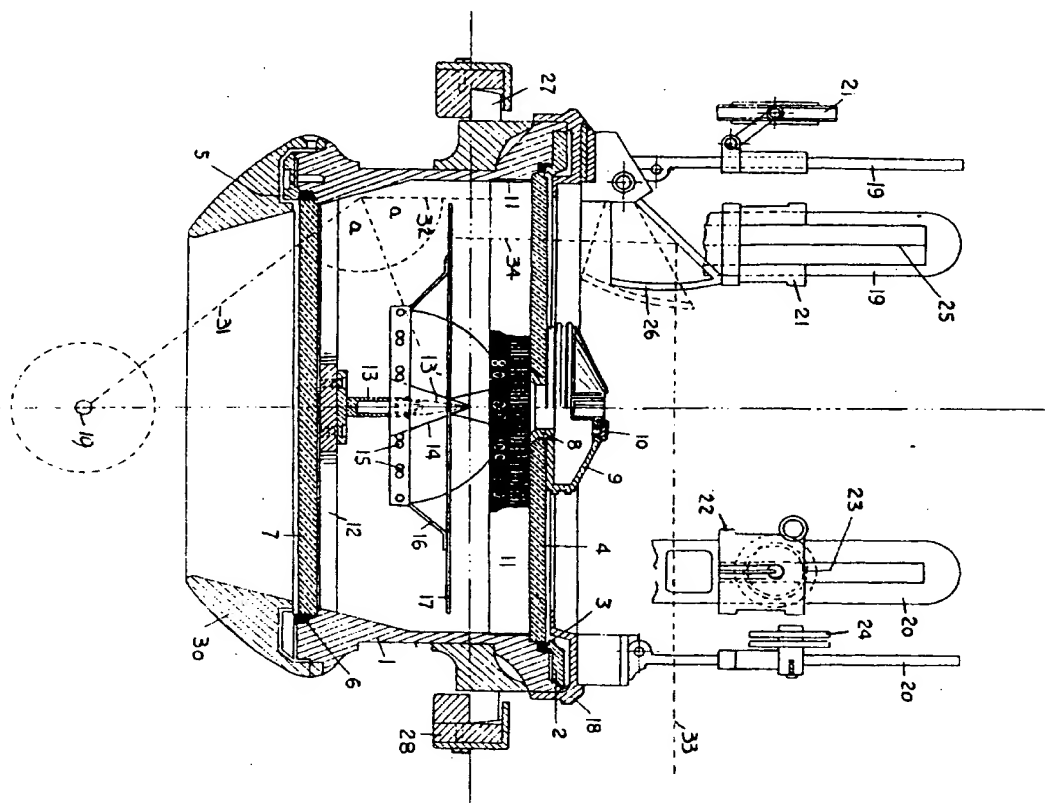


Fig. 2

